INTI
INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	JANUARY 2012
Programme	:	Diploma in Electrical and Electronic Engineering Programme
Course	:	MAT1122 : ENGINEERING MATHEMATICS 2
Date of Examination	:	8 March 2012
Time	:	11a.m. – 1p.m. Reading Time : Nil
Duration	:	2 Hours
Special Instructions	:	

This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted :

Non Programmable Scientific Calculator

Materials provided :

Formula Booklet 1

Examiner(s) : **Ch'ng Pei Cheng**

Moderator : **Chan Ah Wah**

This paper consists of 5 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEE/I)
MAT 1122: ENGINEERING MATHEMATICS 2

FINAL EXAM: JANUARY 2012 SESSION

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Question 1

(a) If $\left(\frac{1+i}{1-i}\right)^m = 1$, then find the least positive integral value of m.

(6 marks)

(b) Let $z_1 = 2 - i$, $z_2 = -2+i$. Find $\left(\frac{\overline{z_1 z_2}}{z_1}\right)$ in exponential form.

(6 marks)

(c) Find all the roots of the complex number $\sqrt[3]{1-5i}$. Leave your answers in polar form.

(6 marks)

(d) Solve the following set of linear equations by applying Gauss-Jordan method on its augmented matrix:

$$\begin{aligned} x + y + z &= 2 \\ x + 2y + z &= 6 \\ y + z &= 1 \end{aligned}$$

(7 marks)

Question 2

(a) Determine the following integrals:

(i) $\int \frac{12dx}{\sqrt{3-8x-x^2}}$,

(7 marks)

(ii) $\int \frac{1}{\sqrt{x}(1-2\sqrt{x})}\,dx$,

(6 marks)

(iii) $\int x^2 \ln x \; dx$.

(6 marks)

(b) Use Euler's method to find the values of y for $x = 0(0.1)0.5$ if

$$\frac{dy}{dx} = y - x, \; y(0) = 2.$$

Give your answers correct to **four (4)** decimal places.

The formula of Euler's method is given below.

$$\frac{dy}{dx} = f(x, y)$$

$$x_1 = x_0 + h$$

$$y_{n+1} = y_n + hf(x_n, y_n)$$

(6 marks)

Question 3

(a) Let $w = \frac{5}{(x^2 + 2y^2)^2}$, $x = \tan u - \sin v$, $y = e^{uv}$. Find $\frac{\partial w}{\partial u}$ and $\frac{\partial w}{\partial v}$.

(6 marks)

(b)

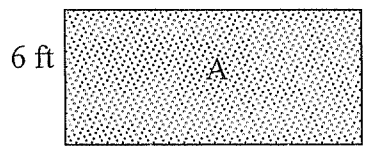

Figure 1

At what rate is the area of a rectangle changing if its length is 8 ft and increasing at 3 ft/s while its width is 6 ft and increasing at 2 ft/s (Figure 1) ?

(4 marks)

(c) (i) Derive the Maclaurin series from first principles of $\tan^{-1} x$ to obtain the first two nonzero terms.

(5 marks)

(ii) Use the result in (i) to approximate $\lim_{x\to 0}\dfrac{\tan^{-1} x - x}{x^3}$.

(2 marks)

(d) Use Laplace transform to solve

$$y''+y = \sin 2t$$

satisfying the initial conditions $y(0) = 2$, $y'(0) = 1$.

(8marks)

Question 4

(a) Find the following Laplace transforms

(i) $L\{t^3 + 2 + \cos 3t\}$,

(3 marks)

(ii) $L^{-1}\left\{\dfrac{3s}{s^2 - s - 6}\right\}$.

(4 marks)

(b) Solve the following initial value problems:

(i) $(x^2 + 4)\dfrac{dy}{dx} + xy = 0$, $y(1) = 1$,

(6 marks)

(ii) $\dfrac{dy}{dx} = \dfrac{2x+1}{2y-2}$, $y(0) = -1$,

(4 marks)

(iii) $\dfrac{dy}{dx} = \dfrac{-3y^2 - 4xy}{2xy + x^2}$ by substituting $y = vx$, $y(1)$=1.

(8 marks)

Question 5

(a) (i) A coin is chosen at random from 3 two-cents and 4 five-cents pieces. What is the probability that it is a two-cents piece?

(2 marks)

(ii) A catering service offers 8 appetizers, 10 main courses, 7 desserts. A banquet committee selects 3 appetizers, 4 main courses, and 2 desserts. How many ways can this be done?

(4 marks)

(iii) The board of studies of a university is made up of 12 men and 16 women. If a committee of 6 is chosen at random, what is the probability that it will contain 3 men and 3 women?

(4 marks)

(b) Bill has to sell three more cars this month in order to meet his quota. Tonight he has after-dinner appointments with five prospective customers, each of whom happens to be interested in a different car. If he has a 30% chance of success with each customer, what is the probability that he will meet his quota by tomorrow morning?

(7 marks)

(c) Media researchers report the average daily TV viewing time for Malaysian adult males to be 4.28 hours. Assume a normal distribution with a standard deviation of 1.30 hours. Determine the probability that a randomly selected Malaysian adult male watches TV

(i) less than 2.00 hours per day,

(4 marks)

(ii) between 3 to 5 hours per day.

(4 marks)

The End